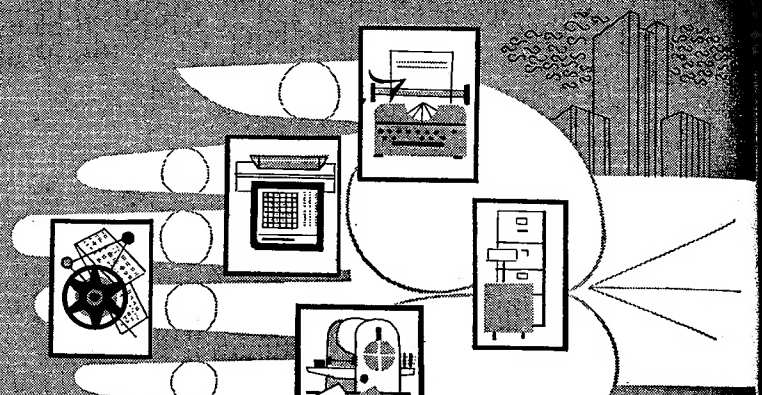
A Monthly Feature

Tools of the Office



Adding and calculating machines; bookkeeping and accounting machines, systems and equipment (including tables, charts, scales)

by Mary D. Lyons

ONE encyclopedia describes the adding machine as follows:

"The adding machine is an apparatus which is used to add numbers. Although some adding machines can be used for multiplication and division, they are not as useful in these operations as the calculating machine is. Adding machines may be operated electrically or by means of a hand lever. Adding machines are important because they speed up bookkeeping in business offices."

It seems unfair that so ponderous a definition should be applied to a machine with such a colorful past. Poetry has been written, and songs have been sung about the adding machine. It was even the title of a famous play by Elmer Rice, produced in 1956 at the Phoenix Theatre in New York.

The abacus was probably the first known calculating device. It was used by the ancient Greeks, Romans, Egyptians, Hindus, and Mexicans, and is still commercially used in the Orient.

The abacus consists of a board in which parallel grooves are cut to contain pebbles, or it may be a rectangular frame of wires in which beads are strung, like the "schety" of Russia, and the "suan-pan" of China.

The "soroban" or Japanese abacus is one of the first objects to attract the foreigner or tourist in Japan. He buys at some shop a few trifling articles, and sums up the total cost in his head. But the Japanese tradesman refuses to bother with mental arithmetic, no matter how simple. He, instead, seizes his "soroban," prepares it by a tilt and a rattling sweep of his hand, makes a few rapid clicking adjustments, and names the price.

The Orient, however, is now about the only place in the world where the abacus is really in wide usage, although, it is again being used in American schools to help students understand the place value in the number system. The abacus has also been adapted to teach blind children how to add and subtract.

Machines had early origin

The history of the development of calculating machines is interesting because of the long interplay between science, technology, and business.

In 1642, Blaise Pascal built a machine to perform addition by using the adding wheel as the basic unit, and in 1693, Gottfried Wilhelm von Leibnitz built a desk calculator capable of multiplying numbers.

Although these devices contained the basic principles of some of our modern computing machines, two hundred years elapsed before they were sufficiently developed and mass produced to become extensively used in computation.

While these simpler machines were still in their early development, Charles Babbage, in England, proposed the construction of two much more ambitious machines.

Babbage, who was an eccentric genius, and also an English mathematician and scientist, first broached the idea of a calculating machine in 1822.

It was through the recommendation of the Royal Society, of which he was a fellow, that he received a sizeable grant from the government for the construction of such a machine.

The letter which Babbage in 1822 wrote to Sir Humphrey Davy, President of the Royal Society, requesting the recommendation is quite famous.

The following excerpt from that letter perhaps expresses one of the reasons Babbage undertook the construction of such a machine.

"The intolerable labour and fatiguing monotony of a continued repetition of similar arithmetical calculations, first excited the desire, and afterwards suggested the idea of a machine, which, by the aid of gravity or any other moving power, should become a substitute for one of the lowest operations of human intellect."

Although Babbage did receive the desired recommendation, and the subsequent grant from the government, he unfortunately abandoned his undertaking after a series of experiments lasting eight years, during which time he spent a great deal of the British

ernment's, as well as his own, money Babbage then began working on a uch more complex device, an analyal machine, which worked with rds, like the Jacquard loom.

However, the government, alarmed the probable demands, refused to pport Babbage in his new project, d the machine was never completed.

It was finally presented in 1943 to e King's College Museum, London, d was subsequently preserved in the outh Kensington Museum.

Babbage's first machine which he lled a "difference engine" was deigned for the construction and printg of mathematical tables; the second, "analytical engine," was designed r general scientific calculations.

One or two "difference engines" ere built by others in the following ecades, but they were not used extenively. The "analytical engine" waited til the present century; the execution the necessary facilities for reading, oring, recording, and control were eyond the capabilities of the times.

Machines are tireless, accurate

What exactly calculators do may em very mysterious, but such mahines actually do nothing more than man or woman who is good at arithetic can do, except that they do it uch more rapidly, more accurately, d without getting tired. The calculaion as a whole seems complicated, but bserved closely, it really consists of othing more than a series of simple, asic operations.

In elementary arithmetic, with a encil and paper, we learn to form the m difference, product, or quotient two numbers of any reasonable size. nd machines that perform all four rithmetic operations are now in everyay use.

In order to have a machine perform n arithmetic operation, it is necessary supply it with two numbers and to nstruct it to perform the required peration.

In the simplest machines the operaor inserts the numbers by means of a yboard, and he initiates the desired peration by striking the appropriate peration control key.

When the operation is completed, e result may appear on dials where e operator can read it and copy it to his computing sheet. In some maines, the result, as well as the indidual factors, may be printed autotically on a paper ribbon.

With such machines, the operator need perform no arithmetic operations. His responsibility is to insert the proper factors and to press the required control key for each operation. If the machine has no printing attachment, he must also transcribe the result.

Small, portable machines with keyboard operation are now manufactured on many assembly lines in this country and abroad, and they are part of the regular equipment of most business offices, and scientific and engineering laboratories.

Those that are limited to addition and subtraction are called adding machines, and those which perform multiplication and division are called desk calculators.

In some of them, the driving power is supplied by the operator, but most of them are equipped with a motor that provides the power when the control buttons are depressed.

The actual arithmetic operations of these are accomplished by means of mechanical devices as distinct from electrical or electronic.

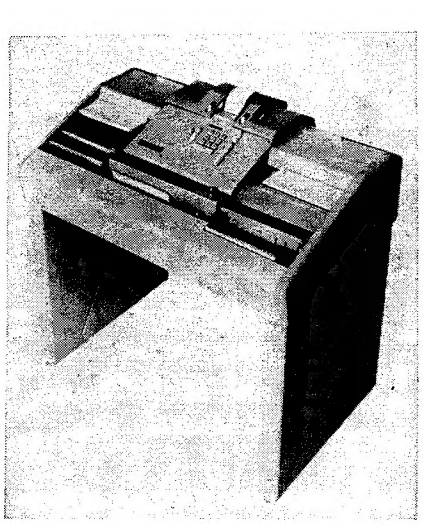
Most of the adding machines have automatic printing devices which print the factors and the results, whereas the results from the calculators appear on dials and are read off by the operator.

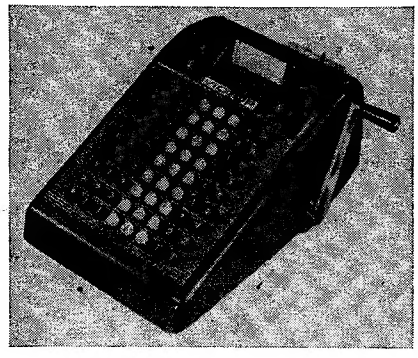
Some of the printing-adding machines can be used for multiplication and division, but their speed and capacity in this work are, in general, not equal to the non-printing calculators.

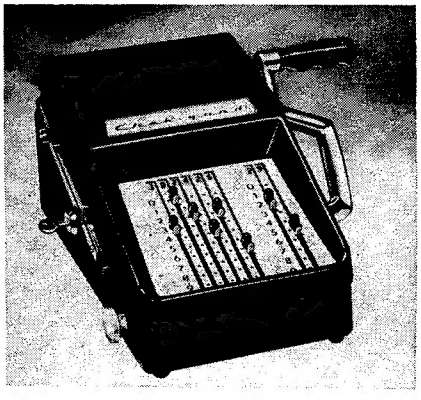
One might think that the simple adding machine and other such standard equipment have rather a shaky future in view of the constantly growing emphasis upon the "automatic office." However, it does not seem likely that old stand-bys such as adding, calculating, bookkeeping, and accounting machines will be superseded at any time in the near future, if ever, by high-powered electronic data processing equipment.

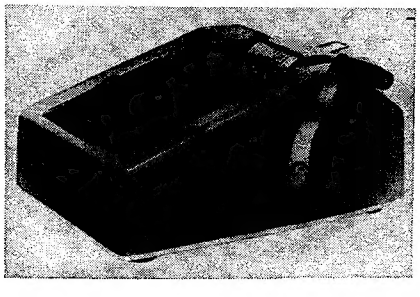
In all probability, standard office equipment will forever play an important role in the day-to-day routines of offices of all sizes. One good reason for this premise is the fact that in spite of the efficient systems programmed into various IDP equipment, tasks of exceptional nature continue to exist, and standard office machines are of infinite worth in these circumstances.

Furthermore, a great many of the nation's offices still do not use any

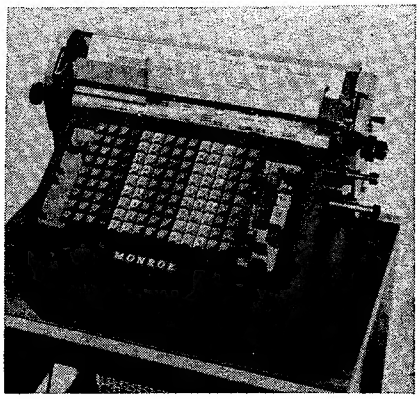


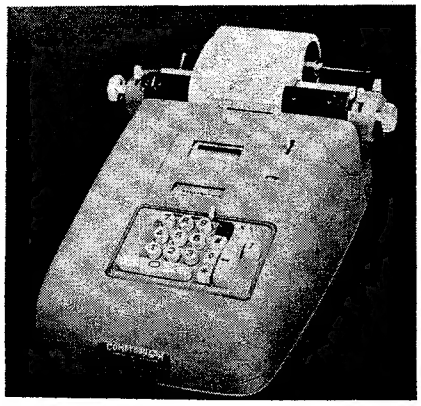


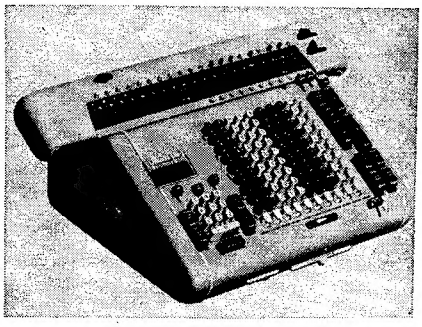




It is not likely that standard office equipment of this type will be replaced in the near future by more complex devices. Above — Royal McBee's Keysort Tab Punch; Victor's 10-key Adding Machine; Safeguard's Mark II Checkwriter; and Facit's Model H-9S portable hand-operated Odhner adding machine.







The onrush of complex office equipment has not replaced standard machines, except in those instances where the standard units were not capable of performing their duties at the speeds required. What has happened, instead, is that the variety of equipment has been made so vast, that each office has a better chance than before of acquiring exactly the kind of equipment, whether large, medium-sized, or small, that it needs. Units shown are, from top to bottom, Monroe's eight-register bookkeeping machine of the "President" series, which has two mechanical registers and eight electro-mechanical registers; Comptometer's Comptograph, Model 220-WS, which has wide automatic shuttle carriage for listing two columns of figures; shuttle travel is adjustable to four widths, and will list automatically reference figures at left, and list and add figures in right hand column; and Friden's calculator, Model SBT, which is fully automatic, and offers chain multiplication and grand total accumulation.

IDP equipment at all, and standard machines are, naturally, the major "tools" of these offices.

Thus, the revolutionary onrush of complex office equipment has not replaced standard machines, except in those instances where the standards were not actually capable of performing their duties at the speeds required. What has happened, instead, is that the variety of equipment has been made so vast, that each office has a better chance than before of acquiring exactly the kind of equipment—whether large, medium sized, or small—that it needs. In order to determine what its needs actually are, the office must, of course, turn to systems study.

Standard adding, calculating, bookkeeping, and accounting machines, not to be left behind in this age of mechanization, are developing on their own. New features which simplify their operation or increase their capacity are constantly being acquired.

It is unlikely that the mechanical speed of this equipment can be increased to any appreciable degree. However, it is possible to accomplish more and more steps automatically on even very small equipment. Obviously, most figuring, including multiplying and dividing, can be broken down into a form of addition or subtraction. What distinguishes the more complex machines from the smaller ones is the degree to which the necessary intermediate steps in the figuring operation can be accomplished automatically.

On an adding machine, therefore, multiplication may be performed by repeated addition. On a calculator, the multiplier may be entered on a separate keyboard, so that the operator has less work to do, and fewer opportunities to err.

Calculators are able to handle a variety of assignments. In fact, calculators may often be quite complicated; aside from their regular duties, some are capable of extracting square roots, and can compute in the binary numbering system. Calculators may also feature a memory unit and recall keys, and the automatic positioning of decimal points.

The primary factor, which distinguishes bookkeeping and accounting machines from adding machines and calculators, is their ability to enter descriptive information. Such information may range from simple codes or date information to complete descriptions. An adding machine can be made to do some descriptive work by the use of the non-add key in connection with numerical codes. The descriptive feature, however, is usually reserved for bookkeeping and accounting equipment, and its capacity may range from a few simple keys to a complete typewriter keyboard.

Moreover, bookkeeping and accounting machines often have more than one register in which to accumulate totals. Naturally, the more registers, the more complicated the machine, and the greater the variety of work it can do.

Certain features of integrated data processing have been incorporated into what are otherwise standard office units. Some of these machines have been equipped to produce a common language record of their operations. For example, an adding machine may produce a punched paper tape as a by-product of normal figuring. Or, a bookkeeping machine may be connected to a card punch. By such methods, conventional equipment can be made part of large systems in which data can be recorded by one machine in a form which can be processed automatically by another.

Emphasis on Systematization

The most recent developments in office work procedures today include greater mechanization in general, increased study of this work to determine which parts are routine, and which parts are of an infrequent, occasional nature, and greater concentration upon systems planning; and also, careful appraisal of the routines to which the various equipment will be applied.

A great number of management executives are aware of the boons offered by mechanization; and as a result, more and more processing of repetitive work is being handled by some type of systematized machinery. Most offices are not large enough to justify the installation of large machines, and so routine work must be accomplished within the capacities of the less complicated machinery which is available.

It would be impractical, of course, to purchase machines first, and then afterwards, attempt to make the work fit them, but it is necessary to understand what types of work may be expected from those machines now on the market, and to determine the best combination of working method and

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Shaw-Walker's Simplified Accounting Plan consists of board to hold forms in alignment, and precision register to eliminate overlapping figures

machine. Since standard machines do offer such a vast variety of capacities and features, it is possible to develop many efficient systems and to coordinate them with the appropriate machines.

Therefore, it seems logical to assume that there will always be office jobs large enough to make use of equipment of any size, jobs neither so small as to waste the capacity of the equipment, nor so large as to tie up the machine department. Also, since the special province of the machine is routine work, exceptions must always be handled individually. For although a large computer installation can be programmed to handle many exceptions to routine without disrupting the work flow, exceptions beyond its capacity must be handled by human agency. And many times the adding or calculating machine proves an essential aid in exception problem-solving.

Another consideration is the importance of standard equipment in preparing input material for feeding into the computer. The accuracy of input data has a direct bearing on the efficient operation of the largest data processor, and speed and accuracy are characteristics of standard accounting equipment when the operator is skilled and experienced.

The result of high-powered mechanization may very well be an increase in the variety of jobs handled by the operator of standard machines, since these will be utilized in exceptional cases where individual decision-making and judgment are of primary concern. Also, consignment of much of the office's repetitive work to the computer will relieve the standard machine operator of monotony, and give to her the opportunity to handle work of a more challenging nature.

"One-writing" and other bookkeeping and accounting systems are other examples of long-established, standard office equipment. "One-writing" equipment is designed to permit the writing of several accounting forms simultaneously. One places the forms one above the other in such an alignment that items written on the top form can be transferred to the forms beneath by means of carbon. This makes it possible to create several different forms that use identical information.

In most instances, only selected items should appear on each form, and provisions are made for prevention of transfer of unwanted data or items. This is accomplished through the use of spot carbon, or by providing an area printed with a heavy design upon which data, although copied by carbon, is illegible on the copies. Certain forms in addition can extend beyond the edges of other forms when properly aligned, so that material which is not to be copied can be placed on the portions which do not overlap. There are, of course, other methods which are used to produce and maintain neat, efficient bookkeeping forms.

Successful arrangements of one-writing accounting system forms rest upon three factors—proper form design, so that information can be recorded in the necessary number of places with a minimum of effort in writing the form and in using the completed form; appropriate use of carbon paper or spot carbon; and provision for a suitable device for holding a set of forms in proper registration. Each of these essentials is taken into careful consideration by the manufacturers of the equipment and forms.

Various devices used

However, the device used to accommodate the forms may be of several types. One such design, called the peg-board, consists basically of a flat writing surface which has been equipped with pegs or other means for holding the forms in registration. This type is usually equipped with some mechanical device for advancing from one set of forms to the next upon the completion of each set. This can be accomplished through the use of a ratchet and lever system; sometimes the board is actually a box with a roller system for mounting and advancing one or more of the forms after use.

Identical results can, of course, be achieved without the use of a board. Some type of loose-leaf binder or other book-enclosed device can be used to hold the forms in alignment—the same principle is used in some kinds of machine bookkeeping, with several forms being printed at once. The latter method, however, is not generally referred to as a one-writing system, since this usually implies manual methods.

Most of the one-writing systems are used in small companies or in the small departments of large companies for such applications as payroll, accounts receivable and payable, and inventory. The distinguishing factor between one application and another lies in the selection of forms, rather than in the design of the basic equipment.

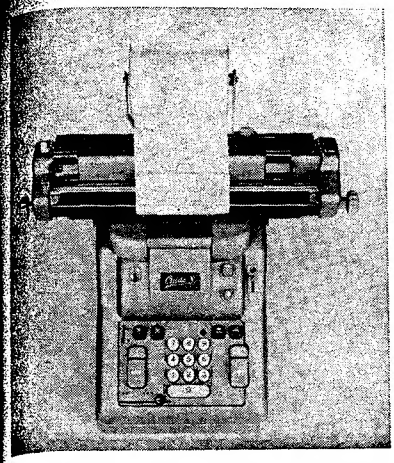
Reports from manufacturers suggest that wider applications are under development, and that specialized systems, aside from the one-writing variety, are increasing in popularity.

Philosophy influenced machine growth

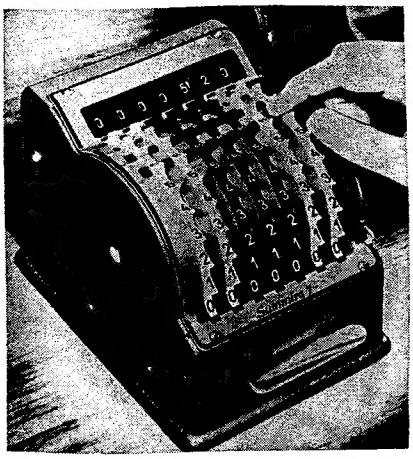
Another important factor which led to the development of adding and calculating machines was the great rise of interest in natural philosophy in western Europe during the 17th Century. With the predictive abilities of the new physical theories of Galileo, Kepler, Descartes, Newton, and others there came a real desire to use these theories, and this called for substantial calculating.

In the early part of the 17th century a man by the name of John Napier invented the logarithm, which made the task of multiplying very much simpler. As a matter of fact, the mechanizing of his logarithms led to the development of a whole new class of calculating machines called analog measurement devices. Napier also developed a physical device for speeding up the multiplication of numbers, since named "Napier's bones," which were widely used in the 17th century, and can still be seen in various museums.

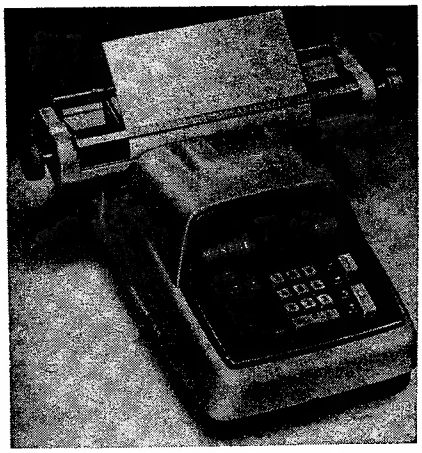
In addition to Babbage, there were other men who made attempts to produce a reliable machine for commercial use in the 19th century. 1820, an instrument, which sold quite widely, was invented by Charles Xa



Model 541-30 adding machine by Addo-x has three-position shuttle carriage



Pictured above is Summira Adding Machine by Fremaco International



Monroe 600, above, is example of Monroe's wide-carriage adding machines

Thomas. And during the last quarter of the century, Frank Stephen Baldwin, and independently, W. T. Odhner, designed machines using a new type of wheel, which made possible a more compact machine; about the same time, A. Burkhardt also developed a machine. These inventions were actually the parents of our modern desk calculators.

It is interesting to realize just how sophisticated these early machines really were; they were quite capable of "understanding" a fair number of "instructions" among other things, and they could perform at command the familiar processes of addition, subtraction, multiplication, and division, as well as the operations of multiplying or dividing by powers of ten, by shifting numbers left or right. They could also store the result of an operation on counter wheels visible to the operator, and data could be introduced by means of keys on a board.

During the 19th Century great advances in mathematical physics were made, and with these came renewed pressures for better calculating instruments. To avoid the problems run into by Babbage, Sir William Thomson (later Lord Kelvin) conceived a new idea for a machine. His machine was not a digital, but depended upon finding and using a physical apparatus which when operated gave an output proportional the desired mathematical operation.

Analog machines are rapid

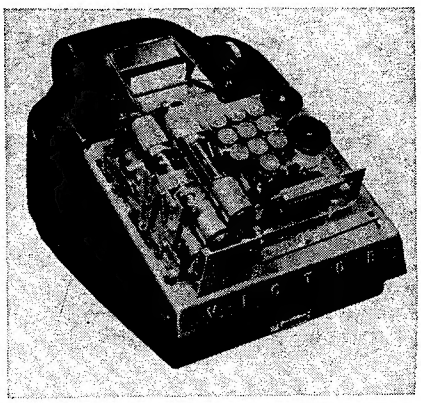
Such devices are called either analog machines, since the physical apparatus is in a sense analogous to mathematical operations, or measurement machines, since the results are obtained by measuring the output of the apparatus. (These were also called continuous machines by Kelvin.) Devices of this category can be fairly rapid although they are inherently not terribly precise since they must rely upon physical analogies and physical measurements.

However, here again, technological difficulties delayed the perfection of a large-scale machine for solving differential equations and embodying Kelvin's ideas, until Vannevar Bush and his associates at the Massachusetts Institute of Technology developed and placed in operation the first differential analyzer in 1930. Kelvin did, however, build the first automatic machine for calculating tidal motions using the disk-ball-cylinder integrator invented by his brother, James Thomson, in 1876. He said, "The object of this machine is to substitute brass for brain in the great mechanical labour of calculating. . . ."

His interest in machines extended over a long period of time and formed the subject of a number of papers. In this interest, he was joined by J. Clerk Maxwell and others.

In carrying out a calculation, man performs three distinct functions which must be incorporated into any automatic machine: (1) He must, first of all, perform basic arithmetic operations; these might be the addition, subtraction, multiplication and division processes; (2) he must read from instruction sheets what he is to do next, e.g., take the number in column one of his work sheet, multiply it by the quantity he has just produced, and store the result in column two; (3) he must store his initial, intermediate, and final results, as well as his instructions on sheets of paper or otherwise.

In the machines preceding Babbage's analytical engine and Kelvin's tidal analyzer, the only portion of the human process of operations that was automatized was the arithmetic portion.



Shown above is Victor's new solenoid actuated Digit-Matic Calculator

This advance was a great one, in that it freed men from the drudgery of multiplication, it was more accurate than man, and it was faster. Nevertheless, it left the other portions of the process in human hands. The differential analyzer of Bush automatized the entire process and was thus the first operative fully automatic calculating instrument which could be programmed to do different types of problems. And it had a fourth feature, not required by the human operator —an input-output.

What a vast difference exists between the first simple abacus and the highly mechanized calculating machine of today. It would be interesting to divine what new changes tomorrow will bring to the adding machine, the calculator, the bookkeeping, and the accounting machine. One thing is certain—that in spite of changes—in spite of complex and revolutionary mechanical improvements, these types of standard equipment will always be the stable and reliable "old friends" of every office.

Tools of the Office

The following list offers a brief description of such equipment on the market. It must be noted that such equipment is extensive, and the descriptions offered cannot begin to cover the technical details that distinguish one machine from another. Basically, the list is designed to act as a guide for those who wish to enter into further research on such equipment.

The Manufacturers

Adding and Calculating Machines

Addo-X, Inc., 300 Park Ave., New York 22. Firm has manufactured three varieties of adding machines, including a 10-key non-printing manual model, an electric 10-key printing, and an electric 10-key non-printing model. Also, two models of calculators; one, an electric 10-key printing; the other, an electric 10-key non-printing model. Firm's automatic multiplier (Model 2341E) is equipped with extra keyboard for automatic "short-cut" multiplication.

R. C. Allen Business Machines, Inc., 678 Front Ave., N. W., Grand Rapids 4, Mich. Allen has offered a selection of manual and electric adding machines, as well as a full-keyboard electric calculator. Features of the firm's 10-key machines have included memory and recall keys; credit balance; single, double and triple ciphers; direct subtraction; and automatic stepover multiplication. Full-keyboard machines have featured credit balance, direct subtraction, automatic clear signal, and automatic space-up total.

Alma Office Machine Corp., 34 E. 30th St., New York 16. Firm offers the Everest line which includes two electric 10-key, printing machines, the M 58 and the Multarapid "S". The M 58 is an adding machine with automatic credit balance, and is priced at $269. The Multarapid "S" features fully automatic multiplication and automatic credit balance, and is priced at $375. Also, the Everest M 4 which performs five operations — addition, subtraction, multiplication, division, and credit balance. Machine automatically prints decimal point in correct position, and is priced at $475.

American Voss Corp., 18050 James Couzens Highway, Detroit 35. Firm has offered the Voss line, which includes one manual 10-key printing, 2 electric 10-key printing and one 10-key printing 2-total adding machine, which is a duplex type, with 2 registers.

Bohn Duplicator Corp., 444 Fourth Ave., New York 16. Firm has offered one model of the BDC Contex manual 10-key non-printing calculator. Features include keyboard locking device to prevent error, and portability.

Burroughs Corp., 6071 Second Ave., Detroit 32. The Burroughs line has offered 47 models of adding machines including the "Thriftline" manual full-keyboard type, electric printing machines with 10-key keyboards; the "Director" electric full-keyboard models, and validating and receipting cash registers. Firm has also offered calculators consisting of 3 manually-operated full-keyboard models and 4 electric full-keyboard machines.

Calculator Equipment Corp., 556 Central Ave., Orange, N. J. Firm has offered three models of the "Scotsman" calculator. Machines are designed for a variety of work loads for both large and small businesses.

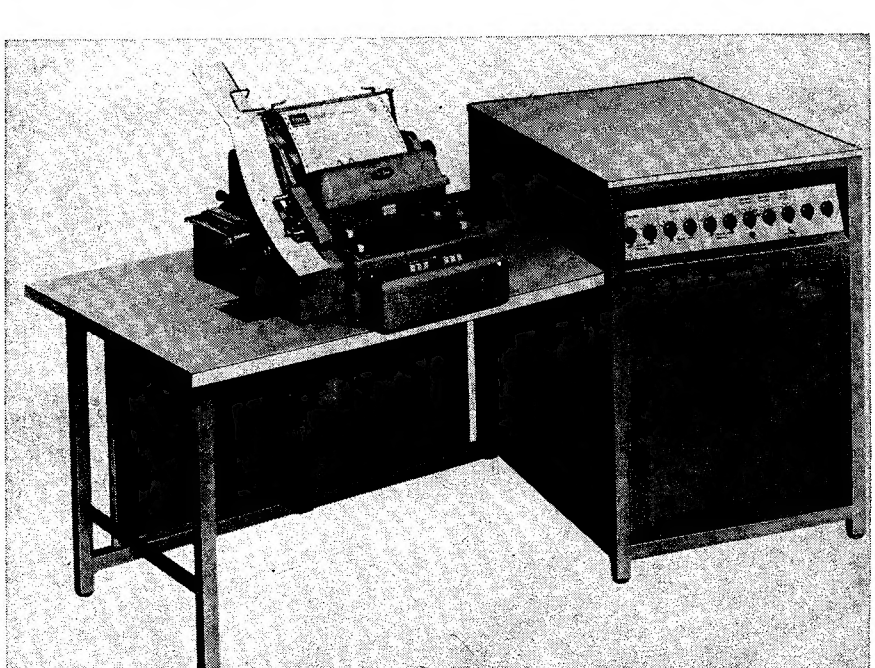
Clary Corp., 408 Junipero St., San Gabriel, Calif. Firm has offered eight models of Clary adding machines, and one Clary electric full-keyboard calculator. Adding machines are of the manual full-keyboard, electric 10-key printing and electric full-keyboard variety.

Classic Calculators, Inc., 387 Fourth Ave., New York 16. The Classic line has included electric printing calculators with 10-key keyboards.

Comptometer Corp., 1735 N. Paulina St., Chicago 22. The Comptograph and Comptometer lines include a variety of manual and electric adding machines and calculators. The Comptometer adding-calculating machines are electric, non-electric, key-driven, non-listing calculators in sizes from 5 to 20 columns. Comptograph calculating-adding machines are electric, 10-key listing machines available in different types. Price ranges: adding machines, $315 to $645; calculators, $265 to $1100.

Control Systems, Inc., 5 Beekman St., New York 38. The Plus line includes 3 models of adding machines and 10 of calculators. The Plus Adders have three different capacities. These machines provide just that part of a Comptometer type calculating machine keyboard used for adding. Plus Calculators are keydrive calculators with three different capacities. They may be manual, Simplex electric, or Duplex electric. Plus-O-Matic Calculators are available in Simplex electric and Duplex electric models, and have two different capacities. Plus Diehl Calculators are full-keyboard, live multiplier rotary calculating machines, with short-cut multiplication; back transfers, and memory registers.

Facit, Inc., 404 Fourth Ave., New York 16. Firm offers Mitey-Add and Odhner lines of manual adding machines with price range of $114.50 to



Pictured above is Friden's new Computyper Model CTS, an automatic writing-computing machine which can be operated by tape or cards

Pictured above is adding machine from Everest line by Alma

$385. Also, Facit and Original-Odhner lines of calculators with price range of $215 to $525.

Fremaco International, Inc., 188 W. Randolph St., Chicago 1. Firm has Summira line which includes 2 manual full-keyboard machines with price range from $30 to $70.

The General-Gilbert Corp., 150 Broadway, New York 38. The General line offers 4 models of electric adding machines. Model 407 which adds and multiplies is priced at $109. Model 408 which adds and subtracts automatically is priced at $149. Model 409 which adds, multiplies, divides, and subtracts, is priced at $179. Model 811 which features a credit balance is priced at $249.

Johnston Adding Machine Co., 13343 Sherman Way, N. Hollywood, Calif. Firm has marketed a line of 10-key adding machines, both manual and electric.

Lanston Monotoype Co., Div. of Lanston Industries, Inc., 24th & Locust Sts., Philadelphia 1. Firm has offered Barret line including 2 models of 10-key printing adding machines, one manual and one electric. Features of 10-key desk adder include direct subtraction, visible dials, automatic shift and multiply key. It also provides printed tape and has non-print feature.

Lighting Adding Machine Sales Co., 2306 W. Slauson Ave., Los Angeles 43. Firm has manufactured the Lightning adding machine, a small portable stylus-operated model.

Marchant Calculators, Div. of Smith-Corona Marchant, Inc., 6701 San Pablo Ave., Oakland 8, Calif. The Marchant adding machine features 10-column listing, 11-column totaling. It is priced at $340. The Marchant calculating line includes 8 models of the electric, full-keyboard type. Price range is from $475 to $985. Deci-Magic machines feature the complete automatic positioning of decimals and carriage dials. Twin-set Figurematic machines feature double entries in keyboard dials as a result of single entry in the keyboard. The design permits grand total accumulation and individual extensions to be registered simultaneously from single entries. Marchant's new "Transflo" calculator is an all-electric, fully automatic model of 10x11x20 capacity and a speed of 1300 counts per minute. Its "figure flow" operation makes possible duplex and triplex calculations, multifactor multiplication, and any number and combination of consecutive calculations. With back transfer as a focal feature, the "Transflo" transfers, stores and recalls products, individual totals, individual subtotals, accumulated grand totals, and the intermediate results in any problem. A single touch of the back transfer key clears all dials and transfers the figures from

Pictured above is 10-key adding machine by Victor

any ten consecutive lower carriage dials to the keyboard dials, in direct alignment. The amount thus transferred to the keyboard dials can be used as a multiplicand, addend, minuend, subtrahend, dividend, or divisor. In multifactor multiplication, each successive product is automatically re-entered in the keyboard as the next multiplicand.

Monroe Calculating Machine Co., Inc., 555 Mitchell St., Orange, N. J. Firm manufactures adding machines in a wide variety of styles, including manual and electric models, full-keyboard and 10-key models. Price range is approximately from $149 to $900. The calculating line consists of about 17 models of the manual full-keyboard and electric full-keyboard varieties. Price range is from under $200 to over $1200. The Monro-Matics, automatic calculators, feature single-key board entry for all factors. Some machines automatically add as they multiply or divide, and store individual answers for use in subsequent computations.

The National Cash Register Co., Main & K Sts., Dayton 9, Ohio. NCR has offered an extensive line of adding machines which includes both manual and electric models. Full-keyboard models are available. Certain machines feature "live" keyboard, in which the amount keys serve as their own motor bars to speed figuring. In the realm of IDP, some adding machines are wired for linkage with either a punched paper tape recorder or a card punch for recording data in machine-sensible form as a by-product of standard computation.

Olivetti Corporation of America, 375 Park Avenue, New York, N. Y. Firm's line includes the Electrosumma 22, an electric adding machine with 10-key keyboard, speed of 220 cycles, and capacity of 12/13; the Multisumma 22, an electric adding machine with automatic multiplication, 10-key keyboard, and capacity of 12/13; Divisumma 24, high speed, automatic, rotary printing calculator with one register, capacity of 12/13; Tetractys, high speed, automatic, rotary printing calculator with two registers, and capacity of 12/13. Price range of adding machines is from $188 to $348. Price range of calculating machines is from $675 to $875.

Olkon Research Corp. of America, P. O. Box 3049, Asheville, N. C. Olkon has offered a line af adding machines, including both manual and electric models with 10-key keyboards, which print results of computation on tape.

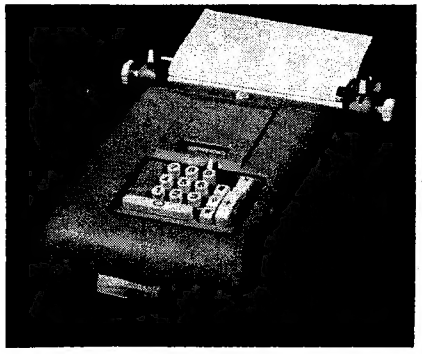
Regna Cash Registers, Inc., 175 Fifth Ave., New York 10. Regna supplies both manual and electric adding machines of various types. Regna's

Olivetti's Multisumma 22 is rapid adding machine with credit balance

Quiet Model" is an adding listing machine. Also, Regna's "Double Two"; and the "Ten-Key" Regna which features a control device just above the keyboard. If the operator is interrupted, a glance at this control will ascertain whether or not the desired number of figures have been transferred to the accumulator.

Remington Rand, Div. of Sperry Rand Corp., 315 Fourth Ave., New York 10. An extensive line of manual and electric adding and calculating equipment is offered by Remington Rand. Included are the "71" manual adding machine which lists and totals automatically, sub-totals, and multiplies; Model "3" electric adding machine has new "contemporary" styling with emphasis on the hand-span keyboard. Machine lists and totals automatically, sub-totals, multiplies, subtracts. Direct credit balance optional; Model "2" non-electric adding machine has same advanced styling and design outlined for Model "3", but is manually operated. The DX-94 electric adding machine provides many calculator benefits such as fully automatic division and rapid single-lever multiplication, addition, subtraction, and credit balance. It features special controls for tabulating numbers, decimal location, and combined operations. Price range of adding machines is from $99.50 to $455. The Model "99" Printing Calculator prints all entries and answers for a "running reference." It instantly proves first-run accuracy, eliminating the need for the operator to check entries with a second run. Fully automatic multiplication, division, addition, subtraction, sub-totals, credit balance, and combinations of these are featured. Exclusive "control key" distinguishes between a cipher and a space; and moves entries to any position on the paper tape without printing superfluous zeroes. Decimal places can be predetermined, decimal points printed. Memory key for re-entering constants is also featured, as well as an automatic switch for accumulative multiplication. Because the "99" doubles as an adding machine, it will handle all general business figurework—billing, pricing, cost accounting, inventory control, payroll, distribution, statistics, etc. Model "98" applies the same printing principle as the "99" to eliminate the need for second confirmation runs, and multiplication by a single operating lever.

Above shows new fully automatic Facit calculator, Model Cal-13



Comptograph, Model 220 SW, by Comptometer, is pictured above

Price range for calculating machines is from $525 to $782.

Silver Bells, Ltd., P. O. Box 982, Carmel, Calif. Firm has offered the Regina and Thales lines of manual full-keyboard adding machines, used for regular computations and, for the Time-Exa model, for hours, minutes and seconds.

Smith-Corona Marchant Inc., 701 E. Washington St., Syracuse 1, N. Y. Firm has four models of the manual full-keyboard type, priced from $89.95 to $151.76.

Swift Business Machines Co., 51 Church St., Great Barrington, Mass. Firm offers a small manually-operated adding machine with 10-key keyboard.

Underwood Corp., 1 Park Ave., New York 16. Firm has manufactured 11 models of adding machines including the Add-Mate and Sundstrand. The Sundstrand electric 10-key printing calculator features flexible date keyboard, keyboard program control, automatic electric carriage return, interchangeable control plates and descriptive symbols.

Victor Adding Machine Co., 3900 N. Rockwell St., Chicago 18. Victor supplies a wide range of adding and calculating equipment. Machines of 10-key, printing manual full-keyboard, electric 10-key printing, and electric full-keyboard models are available in the Imperial and Champion lines. Price range is from $99 to $360. The Victor Automatic Printing Calculator and Mul-O-Matic Calculator are available in both Deluxe and Special varieties, including 4 models of the electric 10-key printing type. Price range is from $435 to $635. Automatic calculator models divide, multiply, add and subtract automatically through one control and a single 10-key keyboard. Other features of this machine include Automatic Constant Divisor and Automatic Constant Multiplication, which automatically reinstate and print the factor; the Total Transfer Button, which permits the automatic re-entering and printing of any total of product a second time for multiplication or division; the Instant Stop Button, and the Select-O-Matic lever, which permits totals or sub-totals automatically with a touch of the motor bar.

Victor has recently developed a model called the Victor serial entry Digit-Matic Calculator which has numerical keys, addition and subtraction keys, and functional keys, all solenoid energized. The Digit-Matic Calculator is also obtainable with solenoid operated numerical and addition and subtraction keys, but with manually operated keys. Associated office and factory equipment such as electric typewriters, punched card equipment, calculators, weighing scales or data tape readers can program and key the calculator.

This automatic calculation by means of a solenoid actuated operation is now being made available to all industries by Victor .

Bookkeeping and Accounting Machines

R. C. Allen Business Machines, Inc., 768 Front Ave., N. W., Grand Rapids 4, Mich. The R. C. Allen line has included 2 bookkeeping machines designed particularly for payroll and accounts receivable. Price range is from $655 to $615.

Burroughs Corp., 6071 Second Ave., Detroit 32. The Burroughs line has included 6 Class 9 electrically operated desk model bookkeeping machines; one Class 10 electrically operated desk model bookkeeping machine; 5 Director "600" electrically-operated accounting machines; 36 electrically-operated Sensimatic accounting machines; 14 electrically-operated Typing Sensimatic accounting machines; 2 Ser-